# **Appendix I – Transportation Documentation**

- WSDOT Property Acquisition Meeting. Meeting Minutes. March 31, 2006. WSDOT Urban Corridor Office.
- Impacts of I-5/SR 509 Project on the Bow Lake Transfer Station. King County Solid Waste Division (2006).
- Local Street Traffic Impact Evaluation for King County Transfer Stations. King County Solid Waste Division (2005).
- Summary of Preliminary Transportation Assessment Bow Lake Transfer Station. King county Solid Waste Division (2004).

# MEETING MINUTES Bow Lake Transfer Station Facility Master Plan Update and Implementation Phase 1 – FMP Update WSDOT Property Acquisition Meeting March 31, 2006 WSDOT Urban Corridors Office

#### Attendees:

Susan Everett, Engineering Manager WSDOT
Paul Johnson, Project Engineer, WSDOT
Andrew Lau, Property Manager, WSDOT
Neil Fujii, Managing Engineer, King Co.
Dwin Ugwoaba, Project Manager King Co.
Tim Hedges, Senior Transportation Engineer, The Transpo Group Harold McNelly, Facilities Management, King Co.
Lillian Holley, Facilities Management, King Co.
Karl Hufnagel, Project Manager, R. W. Beck

- 1. The purpose of the meeting was to review preliminary layout prepared for WSDOT for future possible north bound I-5 on ramp-improvements at the South 188<sup>th</sup> Street, and to identify whether there would be any conflicts stemming from the County's proposed Bow Lake Transfer Station redevelopment project that would impact WSDOT's future improvement plans.
- 2. Neil and Karl first reviewed the latest project site plan layout and site cross sections (attached). WSDOT staff noted that the north access road no longer suggests a future northward extension, which is consistent with WSDOT's preferences as expressed at a previous meeting. Karl made the point that the site plan does not accurately reflect where retaining walls may be needed along the west-side of the proposed north access road, whereas the cross sections (B and C) do indicate that the intention is to have retaining walls along a major part of this road so as not to infringe on WSDOT property. Average daily and peak daily and hourly customer traffic numbers at the transfer station in 2030 were briefly reviewed.
- 3. Susan said that King County should keep in mind that retaining walls adjoining I-5 will need to be designed to accommodate appropriate loading from future vehicular traffic.
- 4. Susan indicated that WSDOT would be amenable to granting a construction easement so that earth embankment on the WSDOT side of the retaining walls discussed in 2 could be removed down to freeway elevation, thereby reducing the overall height of the wall required.

WSDOT Meeting Minutes March 31, 2005 Page 2

- 5. Tim Hedges reviewed the preliminary layout drawing of the on ramp improvements. During the ensuing discussion, WSDOT staff indicated flexibility in the alignment of the ramp lanes such that the apparent conflict or near conflict in the vicinity of the existing cell phone towers might be avoided. It was suggested that the stop bar and control point be moved further north to achieve 1000 feet of queuing length if possible. Paul and Susan discussed the possibility of moving the off and on ramp intersection point further west to enlarge the left turn pocket for customers entering the transfer station.
- 6. Based on the preliminary layout, WSDOT staff indicated that there appeared to be adequate room for WSDOT's planned future improvements, including an additional travel lane on the main line, and the County's project. WSDOT staff indicated that their favorable recommendation on the sale of the property to WSDOT headquarters would be conditioned on maintaining limited access on the proposed north access road.
- 7. Susan discussed the possibility of impact fees or payment of mitigation costs based on the results of the traffic study that will accompany the SEPA environmental review process.
- 8. It was agreed that the next step was for the County to submit an updated drawing (pdf) showing the latest proposed site arrangement coupled with the on ramp improvements revised as discussed above.

#### Attachments

Distribution: Attendees, Greg Harry, KPG, Ian Sutton, R. W. Beck, Steve Bingham, Adolfson

File: 11-00839-10000/2003



# **MEMORANDUM**

Date:	February 7, 2006	TG:	02150.00
To:			
From:			
cc:			<del></del>
Subject:	Impacts of I 5/SR 509 Project on the Bow Lake Tra	ansfer Sta	tion

This memorandum discusses the I-5/SR 509 Freight and Congestion Relief project in southwest King County and the impacts that may be incurred near the Bow Lake Transfer Station.

#### Project Description/Need

The I-5/SR 509 Freight and Congestion Relief project will extend SR 509 from its existing termination point at South 188th Street /12th Place South to a connection with Interstate 5 at South 200<sup>th</sup> Street. In addition to this connection I-5 south will be widened from Military Road to South 320<sup>th</sup> Street. This connection will serve current and future transportation needs by enhancing the southern access to Sea-Tac Airport.

# **Existing/Future Conditions**

Currently SR 509 terminates at South 188th Street / 12th Place South and does not connect to the regional transportation highway system, causing congestion along 188th Street, SR 99, and I-5 during peak hours. Increases in future traffic volumes caused by economic growth and increased airport activity will result in continued congestion along 188th Street, SR 99, and I-5.

# **Future Circulation With-Project**

The implementation of the SR 509 extension to I-5 will provide a direct connection to Sea-Tac Airport and shift traffic from existing travel routes enabling better circulation on SR 99, I-5, and 188th Street corridor. The addition of travel lanes along I-5 will also reduce congestion in the area. Motorists currently traveling on I-5 to access SR 509 via South 188th Street will be removed from this interchange and shifted to the new connection provided at South 200th Street

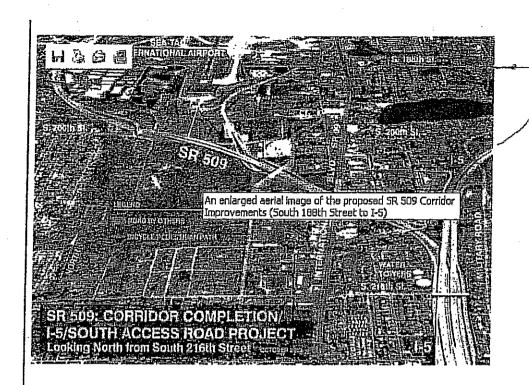
#### Impacts to Bow Lake Transfer Station

The SR 509 project should have little to no impacts on the area near the Bow Lake Transfer Station. Physically no changes to the interchange will affect right-of-way or access to Bow Lake Transfer Station. Additional lanes added to Interstate 5 will occur south of the site. Traffic volumes adjacent to the transfer station currently travel to/from the east via Orillia Road. Future circulation with the implementation of the SR 509 extension will not re-route the majority of these travelers. 2020 PM

The Transpo Group Inc. 11730 118th Avenue N.E. Suite 600 Kirkland, WA 98034-7120 425.821.3665 Fax: 425.825.8434

peak hour level of service on Orillia Road is not expected to change with or without the project. g grant of the company of the first program of the contract of al land a la <mark>company of the second states of the second states of the second states of the second second states of the second states of the second second states of the second states of the second second states of the s</mark> garage and the against the first section of the we have the of the state of the second and the first of the companies are the state of the state of 新的人,只有有效的人,只要是100mm,不是100mm。 医垂直性 经收益帐款 建氯甲基酚磺胺二氢苯 the second of the second of the second · De la Carte de Cart the control of the co The growing decision of the late of the and the second and the second and the property of the control of the state of the state

The Transpo Group



An enlarged aerial image of the proposed SR 509 Corridor Improvements (South 188th

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# **Local Street Traffic Impact Evaluation** for King County Transfer Stations

Prepared for King County Solid Waste Division

Prepared by HDR Engineering, Inc. 500 108th Avenue NE, Suite 1200 Bellevue, WA 98004

March 18, 2005



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#### INTRODUCTION

King County is currently assessing existing conditions at five transfer stations in an effort to determine what improvements could be implemented at some or all of the facilities. The County is evaluating 19 measures of effectiveness, including but not limited to, travel time to the facility, time spent on site, recycling services meet goals, daily handling capacity, safety, meets local noise ordinances, and meets criteria for acceptable traffic impacts on local streets.

This technical report documents the analysis for addressing one of the 19 measures of effectiveness, specifically, Criteria 15 as follows:

- 15. Meets Criteria for Acceptable Traffic Impacts on Local Streets
  - a) Local intersections remain below capacity if additional traffic is added, as defined by the Highway Capacity Manual
  - b) On average, traffic queues entering the transfer station do not spillover onto or impede local streets during 95 percent of the operating hours

The five King County transfer stations that were evaluated are:

- Algona Station, located in the City of Algona and having immediate traffic impacts to Algona, Auburn and King County local streets,
- Bow Lake Station, located in the City of Tukwila and having immediate traffic impacts to Seatac, Kent, and King County local streets,
- Factoria Station, located in the City of Bellevue and having immediate traffic impacts to Bellevue local streets,
- Houghton Station, located in the City of Kirkland and having immediate traffic impacts to Kirkland, and
- Renton Station, located in the City of Renton and having immediate traffic impacts to Renton.

The methodology, data collection, and results for Criteria 15 are provided in detail in the following report.

# **METHODOLOGY**

# Intersection Analysis

For Criterion 15a, the traffic analysis software program Synchro/SimTraffic was used to analyze local intersections. Most agencies require the analysis of the weekday p.m. peak hour, because it is typically the time period that the local street system is experiencing the most traffic. Although traffic associated with King County transfer stations may not be the highest during the weekday p.m. peak hour, the total volume on the local street system will likely be higher during the weekday p.m. peak hour, than during an hour that demand is highest for a transfer station (typically on a weekend). For this reason the weekday p.m. peak hour was analyzed at each of the study intersections.

A traffic operational analysis (level of service (LOS) and volume-to-capacity calculation) was performed at the intersections selected by each host Agency deemed to be most impacted by transfer station traffic. LOS refers to the degree of congestion at an intersection, measured in average control delay, and based on the methodologies provided in the Highway Capacity Manual. LOS A represents free-flow conditions (motorists experience little or no delay and traffic levels are well below roadway capacity), LOS F represents forced-flow conditions (motorists experience very long delays, in excess of 80 seconds at signalized intersections

and more than 50 seconds at unsignalized intersections, and traffic levels exceed roadway capacity), and LOS B to E represent decreasing desirable conditions. A more detailed discussion of the LOS concept is presented in the technical report.

The volume-to-capacity ratio (v/c) is the peak hour traffic volume (vehicles/hour) at an intersection divided by the maximum traffic volume that the intersection can maintain. For example, when v/c equals 0.85, it can be said that peak hour traffic uses 85 percent of the intersection's capacity; or 15 percent of the capacity is not used. When v/c approaches 1.0 (e.g., 0.95), traffic flow becomes unstable such that small disruptions can cause traffic flow to break down and long traffic queues to form.

If an intersection operates at LOS F or exceeds a v/c of 1.0. Criteria 15a is not achieved.

As mentioned previously, each host Agency selected the intersections that they deemed to be most impacted by transfer station traffic, with the exception of the City of Renton. The intersections analyzed in the City of Renton were selected by the project team in the absence of recommendations directly from the City. Intersection p.m. peak hour turning movement counts and intersection channelization were either obtained directly from the host agency, or collected in the field. The selected intersections are as follows for each transfer station:

#### Algona

- West Valley Highway/Driveway
- West Valley Highway/15th Street SW
- West Valley Highway/15th Street Svv West Valley Highway/1st Avenue N

#### **Bow Lake**

- Orillia Road/Driveway
- S. 188th Street/I-5 NB Ramp
- S. 188th Street/Military Rd.

#### Factoria

- Richards Road/SE 32nd
- Richards Road/Eastgate Way

#### Houghton

- 116th Avenue NE/NE 60th Street
- 116th Avenue NE/NE 70th Street
- 116th Avenue NE/I-405 NB ramps
- NE 60th Street/Driveway

#### Renton

- NE 3rd St/Edmonds Avenue NE
- NE 4th St/Jefferson Avenue NE
- NE 4th St/Union Avenue NE

# Queue Analysis

For Criterion 15b, basic queuing theory as described in Traffic Flow Fundamentals (Adolf D. May, 1990) was applied to estimate the average queue formed at each transfer station weigh station upon entering. The equation used to estimate the average queue is as follows:

$$E(n) = (2\rho - \rho^2) \div (2(1-\rho))$$

E(n) = average number in system (vehicle)

= traffic intensity

$$\rho = \frac{\lambda}{\mu}$$

 $\rho = \frac{\lambda}{\mu}$   $\lambda = \text{mean arrival rate (vehicles per hour)}$ 

= mean service rate per lane (vehicles per hour)

In addition, the following assumptions were made in order to apply the above queuing equation to the available data:

- Vehicle arrival rate is assumed to be random, that is, vehicles do not arrive at transfer stations at equal increments of time, rather they arrive at "random" times.
- Vehicle service rate is assumed to be constant
- Traffic intensity (volume-to-capacity ratio) must be less than 1.0
- There is only one inbound scale at each transfer station

If the average vehicle queue exceeds the available storage capacity, then the queue is spilling over onto the local street system or impeding local street operations. The available storage capacity was defined as the distance from the inbound transfer station scale to the first driveway or intersection on a local street or a point on the local street at which the queue from the transfer station would impede non-transfer station traffic.

If the average queue exceeds the available storage capacity more than 95 percent of the operating hours. Criteria 15b is not met.

For Criteria 15b, transaction data entering each transfer station was obtained from King County. for every operating hour and every operating day in 2004. That data indicates the hourly demand for each transfer station by vehicle type. Based on two studies performed by King County in the mid 1990's at the Algona, Renton. Bow Lake, and 1st Avenue NE transfer stations, it was determined that the average time spent on the inbound scale is between 22 and 28 seconds. With these two pieces of data (hourly demand and average transaction time) the average vehicle queue waiting to be served entering a transfer station was calculated based on the equations listed above.

At one station, the Bow Lake Transfer Station, each hour was not analyzed. Out of the 22 hours of the day that Bow Lake is open, only the core hours of 8 am to 6 pm for weekdays and 8:30 am to 5:30 pm for weekends were analyzed, so that the data did not skew the results for hours where little traffic is experienced.

### Forecasts

Both Criteria 15a and 15b were also analyzed based on 2030 projections, provided by King County. The Solid Waste Division developed the projections using its forecast model. This model predicts waste disposal based on such factors as growth in population, employment, income, and assumptions about additional recycling activity.

#### RESULTS

# Intersection Analysis

The results for Criteria 15a, the intersection operational analysis, are summarized in **Tables 1** and **2** for existing conditions (2005) and 2025, respectively. In 2005, the Algona, Factoria, and Renton transfer stations all meet current intersection LOS standards (Criteria 15a). Both the Bow Lake and Houghton transfer stations have one intersection that does not meet the current intersection LOS standard, meaning, the intersection is LOS F and/or the v/c ratio is greater than or equal to 1.0. At Bow Lake, it is estimated that if there were no vehicles related to the transfer station at the intersection, the intersection would operate below capacity. Conversely, at the Houghton station, the intersection exceeds capacity even without traffic associated with the transfer station.

By 2025, all of the transfer stations have at least one over-capacity intersection impacted by the transfer station, with or without additional growth at the transfer station (see **Table 2** and **Figure 2**)

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Figures 1 and 2 illustrate the same information presented in Tables 1 and 2, graphically.

Table 1
Criteria 15a - Existing Conditions (2005) Analysis Summary

			Existing	wlo Tra	nsfer S	ation	Existin	ig w <i>l</i> Tr	ansfer S	Station
Facility	Intersection		Delay (sec/veh)	LOS	V/C	Meets Criteria?	Delay (sec/veh)	LOS	V/C	Meets Criteria?
Algona		0	n/a ,	n/a	0.82	YES	38.4	i Ei	0.83	YES
	WYH/15th St	8	22.0	C	0.88	YES	227	C	0.89	YES
	WVH/ist Ave	<b>Q</b>	41.8	E	0.39	YES	43.0		0.40	YES
-Bow Lake	Orillia Rd/Driveway	Q.	η/a	n/a	075	YES	- >110 · ·	Ė	1,09	No
	. 188th St/l-5INB Rmp	18	29.0	Ċ	0.94	YES	29.9	C	0.95	YES
	- (88th St/Military Rd	8	27.5	C	88.0	YES	27.6	C	0.68	YES
Factoria	Richards Rd/32nd St	*	13.2	В	0.48	YES	15.1	В	0.50	YES
i actoria	Richards Rd/Eastgate		31.5	С	0.81	YES	31.2	C	0.81	YES
Hoverton	116h:Ave/60h St	9	18.8	C-	0.80	YES	198	Ğ	0.81	YES
	116th Ave/70th St	8	55 1	Ē	100	NC :	- 684	HR	100	NO
	i 16th Ave/L405 NB Rmo	8		Ö	.0.93	YES	34.8	C	0.93	YES:
	60th St/Driveway	<b>P</b>	ηa	n/a	0.08	YES	94	Α	89.0	YES
	3rd St/Edmonds Ave		13.9	В	0.67	YES	13.9	В	0.67	YES
Renton	4th St/Jefferson Ave	113	15.6	В	0.75	YES	15.6	В	0.75	YES
÷	4th St/Union Ave		17.0	В	0.72	YES	17.0	В	0.72	YES

#### Notes:

- 1. = signalized intersection, = stop-controlled intersection
- 2. Delay, or control delay, is measured in seconds per vehicle, and is a measure of all the delay contributable to traffic control measures, such as signals or stop signs. At signalized intersections and all-way stop-controlled intersections, the reported delay is the average of all the control delay experienced for all movements. At one-way and two-way stop-controlled intersections, the reported delay is for only one movement, the movement experiencing the worst control delay, which is typically one of the stop-controlled side street approaches. The control delay reported at two-way stop-controlled intersections is not a valid indication of the operations of the entire intersection.
- LOS refers to Level of Service and is based on the methodologies outlined in the 2000 Highway Capacity
  Manual. LOS is rated from "A" (low delay) to "F" (delay in excess of 80 seconds per vehicle at signalized
  intersections, and 50 seconds at unsignalized intersections).
- V/C = volume-to-capacity ratio
- 5. n/a = not available because this intersection is stop-controlled and the movement experiencing the worst control delay would be the movement exiting the transfer station, and because this scenario assumes no traffic associated with the transfer station, there is no control delay to report.

Table 2
Criteria 15a - Future Conditions (2025) Analysis Summary

			2025 w/o Growth at Transfer Station				2025 w/ G	rowth at	Transf	er Station
Facility	Intersection		Delay (sec/veh)	LOS	V/C	Meets Criteria?	Delay (sec/veh)	LOS	V/C	Meets Criteria?
Algona	WVH/Driveway	<b>-</b>	≥110 -		1,26	No :	>110		1:26	No
	WVH/15th St		94.8	E	£1,28	NO.	94.5	F	1,29	No
	LWYH/1st Ave	0	¥110 ;		n/e	NO -	\$100	F	n/c	ΝŌ
Bow Lake	Orillia Rd/Driveway	•	:- 15110	.F	π/ο	NO	>1/0	Ī	n/c	, <b>NO</b>
	. 188th St/l-5 NB Rmp	<b>3</b>	≥(1(0	F	1.52	NO	≥110	F	1.54	NO
	1881h St/Military Rd	8	51.0	D	0.99	YES	51.5	D.	0.99	YES
Factoria	Richards Rd/32nd St		24.2	С	0.76	YES	26.6	С	0.79	YES
i actoria	Richards Rd/Eastgate		>110	F	1.23	NO	>110	F	1.23	NO
Houghton:	- Í JBIN Ave/Guln St	P	≥110			NO		F, a	1,44	NO.
	116th Ave/Zoth St	8	>110		i 151	NO	- 10 - 10 - 10 - 10 - 10 - 10 - 10 - 10	F	1.51	NO
		<b>B</b>	i≥no .		1:02	No	<b>2110</b>		1.33	NO
	60lh St/Driveway	Q.	102	В	0.12	YES	107		0.12	YES:
Renton	3rd St/Edmonds Ave		21.8	C	0.95	YES	21.8	C	0.95	YES
	4th St/Jefferson Ave		17.8	В	0.85	YES	18,4	В	0.86	YES
	4th St/Union Ave		90.6	F	1.13	NO	91.3	F	1.13	NO
B1-4										

#### Notes:

- 1. = signalized intersection, = stop-controlled intersection
- 2. Delay, or control delay, is measured in seconds per vehicle, and is a measure of all the delay contributable to traffic control measures, such as signals or stop signs. At signalized intersections and all-way stop-controlled intersections, the reported delay is the average of all the control delay experienced for all movements. At one-way and two-way stop-controlled intersections, the reported delay is for only one movement, the movement experiencing the worst control delay, which is typically one of the stop-controlled side street approaches. The control delay reported at two-way stop-controlled intersections is not a valid indication of the operations of the entire intersection.
- 3. LOS refers to Level of Service and is based on the methodologies outlined in the 2000 *Highway Capacity Manual*. LOS is rated from "A" (low delay) to "F" (delay in excess of 80 seconds per vehicle at signalized intersections, and 50 seconds at unsignalized intersections).
- 4. V/C = volume-to-capacity ratio
- 5. n/c = the volume-to-capacity ratio exceeds calculable limits.

Figure 1
Criteria 15a - Existing Conditions (2005) Analysis Summary

Existing w/o Transfer Station Existing w/ Transfer Station

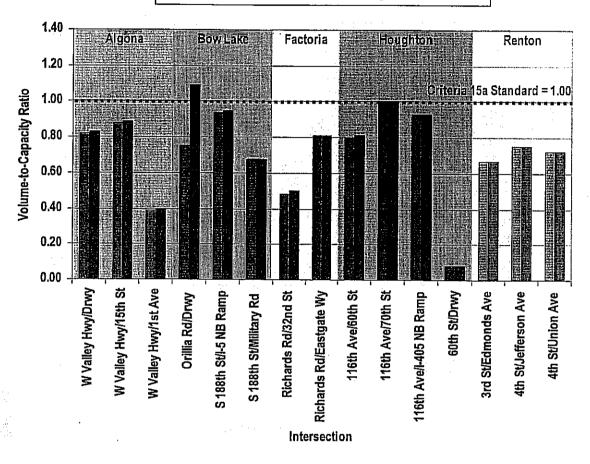
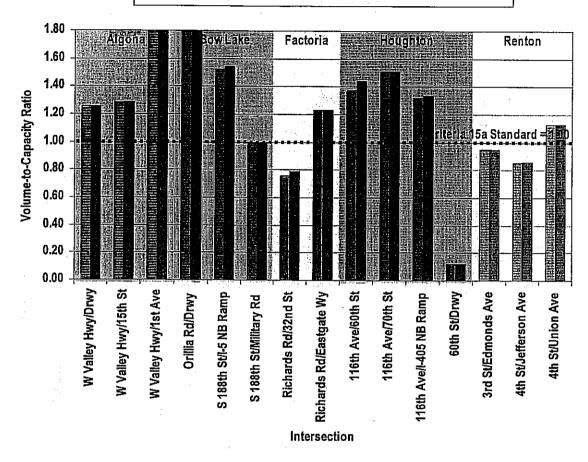


Figure 2 Criteria 15a - Future Conditions (2025) Analysis Summary

🗃 2025 w/o Transfer Station Growth 🗃 2025 w/ Transfer Station Growth



# **Queue Analysis**

In order to determine if the average queue at each of the transfer stations exceed available storage, the average vehicle length must be calculated. The average vehicle length was calculated based on the mix of passenger cars versus transfer station trucks at each facility, and assuming 25 feet per passenger car and 75 feet per transfer station truck. The average vehicle length is summarized in **Table 3**.

Table 3
Average Queue Capacity by Site

	Average Vehicle	On-Site Qu	Queue Capacity		
Facility	Length (feet)	Length (feet)	No. of Vehicles		
Algona	27.4	135	4		
Bow Lake	32.5	476	14		
Factoria	26.8	64	2		
Houghton	28.6	346	12		
Renton	26.5	70	2		

#### Notes:

- The average vehicle length was calculated based on the average mix of passenger cars versus transfer station trucks at each facility, and assuming 25 feet per passenger car and 75 feet per transfer station truck.
- The queue capacity was provided by King County and is the distance from the weigh station to the first off-site intersection or driveway that would be impacted by the queue of vehicles at the transfer station.

The 2004 existing condition results of the Criteria 15b analysis, queuing, are presented in **Table 4**. Based on all data available in 2004 from January to December, only the Renton transfer station meets Criteria 15b, where traffic queues entering the transfer station do not spillover onto or impede local streets during 95 percent of the operating hours. The data was further analyzed to determine if the majority of the off-site queuing took place on the weekend or weekday. In fact, all of the transfer station sites would meet the queue criteria on a weekday, i.e. none of the sites queue off-site more than 95 percent of the operating hours on a weekday. Conversely, all of the transfer stations fail the criteria 15b on weekends.

Table 4

Criteria 15b – Queue Capacity Analysis Summary

Ali Days in 2004

		– -,	AUU-!		
Facility	Days of Week Analyzed	Total Hours Analyzed	No. of Hours Queue Exceeds Capacity	Percent of Hours Queue Exceeds Capacity	Meets Criteria?
Algona	Weekday	2,995	45	2%	YES
	Weekend	1,002	454	44%	NO
	All Days	4,017	499	12%	NO
Bow Lake	Weekday	2,615	20	1%	YES
	Weekend	1,007	286	28%	NO
	. Ali Days	3 622	306	8%	No
Factoria	Weekday	4,010	35	1%	YES
	Weekend	1,018	415	41%	NO
	All Days	5,028	450	9%	NO
	:= Weekday	2485		111111111111111111111111111111111111111	Yes
	Weekend:	1,014		17/96	NO
	AllDays	3,499	186	5%	NO
Renton	Weekday	2,658	न्याः स्थापनायः स्था स्थापनायः स्थापनायः	0%	YES
	Weekend	1,022	81	8%	NO
·	All Days	3,680	82	2%	YES

It should be noted that at the Bow Lake transfer station, the analysis for Criteria 5, which evaluated the onsite capacity of each transfer station, indicated that station has adequate capacity (LOS C) in 2005 on site to handle existing traffic flows. Therefore, the fact that Bow Lake does not meet the off-site queue criteria would indicate that the off-site queue is not related to the on-site capacity for this station. Rather, the constraint is the process time at the scale. King County implemented new operating hours and made some functional changes at all of the transfer stations in the latter half of 2004, specifically July to December. As a result, the queue data was reanalyzed using data from only the latter half of the year to determine if the hours of operation and functional changes would have made a difference with respect to off-site queuing. **Table 5** summarizes the queue analysis results for data represented by July to December 2004. Both Renton and Houghton meet Criteria 15b, when only the latter half of 2004 is analyzed, as well. Similar to the data analysis for the full year, all of the sites meet Criteria 15b on a weekday, while none of them meet the criteria on a weekend. With the exception of the Algona transfer station, all of the transfer stations experienced fewer occurrences of the queue spilling over onto City streets or impeding traffic flow.

Table 5
Criteria 15b – Queue Capacity Analysis Summary
July to December in 2004

.4 -		outy to boo	U		
Facility	Days of Week Analyzed	Total Hours Analyzed	No. of Hours Queue Exceeds Capacity	Percent of Hours Queue Exceeds Capacity	Meets Criteria?
Algona		1,458	40	3%	YES
	Weekend	491	221	45%	NO
	All Days	1,949	261	13%.	NO
Bow Lake	. Weekday 🕒	1,508	18. 7.5.0	1%	YES .
	Weekend	487	107	22%	NO::
	All Days	1795.	125	7%	NO
:	Weekday	1,786	26	1%	YES
Factoria	Weekend	490	184	38%	NO
4.* 	All Days	2,276	210	9%	NO
· Houghton	i i	1,799		1%	i eyes :
	Weekend	489	69	j2%	NO
	- All Days	1 1,668	86	157	YES
Renton	Weekday	1,326	, 1 x - <b>1</b> 4 - 1 -	0%	YES
	Weekend	493	29	6%	NO
	All Days	1,819	30	2%	YES

**Table 6** summarizes the queue analysis based on 2025 projections of transfer station use. By 2025, none of the facilities will satisfy Criteria 15b, with queues extending off-site between 15 and 41 percent of the time, depending on the location. In fact, even weekdays will experience queue failure at all the transfer stations, with the exception of Renton.

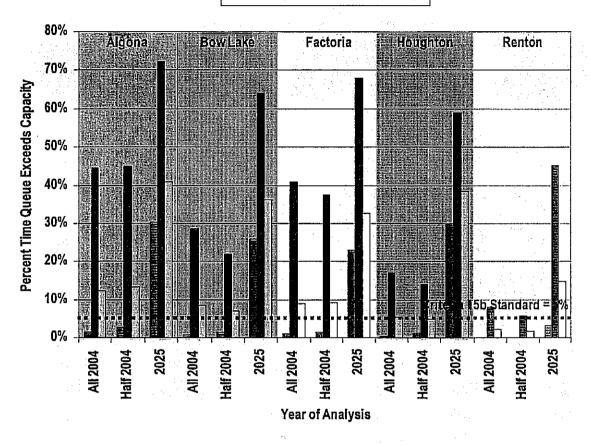
Table 6
Criteria 15b – 2025 Queue Capacity Analysis Summary

Facility	Days of Week Analyzed	Total Hours Analyzed	No. of Hours Queue Exceeds Capacity	Percent of Hours Queue Exceeds Capacity	Meets Criteria?
Algona	Weekday	1,458	442	30%	No
	Weekend	490	354	72%	NO
	All Days	1,948	796		NO
Bow Lake	Weekday	1,308	339	26%	NO
	Weekend	487	312	64%	. NO
	All Days	1,795	651	36%	NO.
	Weekday	1,786	412	23%	NO
Factoria	Weekend	490	333	68%	NO
·	All Days	2,276	745	33%	NO
Houghton	Weekday	1,199	660, 1	30%	NO
	Weekend	488	288	59%	NO.
	All Days	:1,687	648	38%	No
Renton	Weekday	1,326	43	3%	YES
•	Weekend	493	223	45%	NO
	All Days	1,819	266	15%	NO

Figure 3 illustrates the data provided Tables 4, 5, and 6, graphically.

Figure 3
Criteria 15b – Queue Capacity Analysis Summary

■ Weekday ■ Weekend □ All Days



	Ť	4	. ↓ ✓	**************************************			
Moveled billion of the control of	BENEFE IN THE	BREE SHE	SETE	<b>ASTVE</b>			
Lane Configurations	<b>^</b>	*	ተ ላት	7			
Sign Control	Free		Free Stop				1
Grade	0%		0% 0%			•	
Volume (veh/h)	1753	8 19		21			
Peak Hour Factor		92 0.92	0.92 0.92	0.92	رير د دو دو		
Hourly flow rate (vph) Pedestrians	1905	9 21	1570 9	23			
Lane Width (ft)	i og men	a di dina	i e de la companya d	Harildinik i sistri	e kalang debake.	i Baranan da Baranan da B	
Walking Speed (ft/s)				事を記載を行ったい		(特) (国) 数数1.5° ~ 1	
Percent Blockage	ta y typy typy y a	Section 1					
Right turn flare (veh)		- 18 - 18 - 18 - 18 - 18 - 18 - 18 - 18	te oruged Magazes	and the factor of the second of	Control of Marin Control of	रशिष्य स्था स्थानित स्थानित स्थानित स्थिति	
Median type			None	<b>副</b> 模模形态。	<b>张马马克福斯第</b>		
Median storage veh)					these enteriors of the Company of the Green	HOLDER TO THE STATE OF THE STAT	124
Upstream signal (ft)			244	<b>医到巴特尔</b>		针器研究形象的	
pX, platoon unblocked	مسراف مراوعها ومراد تعام فاداد	n nen Rii in ih n	0.76	emazon innégativo estador	Date is established to the columbia.	an interest of the second of the second	* .
vC_conflicting volume		1914	2736	957	<b>的种类主义</b> 的		
vC1, stage 1 conf vol vC2, stage 2 conf vol						Adding utipagnets	generally seguing
vCu, unblocked vol		1914	2964	957	想到建筑性是否	Matabaran d	Mark Walter
tC, single (s)		4 1	6.8	6.9	HELEN CHICAGO	NE GENERAL	
tC, 2 stage (s)		and the second second	out to the technological and the	aratemarina da 1	nation in a substitute of the season was	error er ert fillig i die f	• • • • •
tF(s)	The state of the s	. √ 2.2	3.5	the state of the s			
p0 queue free %	entranta de la compansa en la compa	93	0	91			makiyy.
cM capacity (veh/h)		306		258			
	NEVISIONE	2周88 <b>8</b> 38	SB2 (SBA)	SWEIRSWE			
Volume Total 等等等等	/ 1270 <b>- 6</b>	44 6 21 元	<b>#785章 785</b> 章	章		可認的音句。例如	物學學
Volume Left	0	0 21	0 0		)		CF 21612 V-4-17.7
Volume Right	是EON	91 70	0.000	變 0 是 2	** 1 . 1 · · · · · · · · · · · · · · · · ·	期間達到:江南	的。 1915年 - 1916年
cSH Volume to Capacity	1700 17		1700 1700	8 25		of house Miller of the en	State State State
Queue Length 95th (ft)	0.75 0.: 0	38 U.U.	0.46 0.46 0 0	March 1940 and the Contract		公司基础人 公东	
Control Delay (s)			0.0				
Lane LOS	ಎ.ಎ.ಎ.ಪರಾಖನೀತ್ ನ	C		F	·····································	had because the second	第四·通过者:
Approach Delay (s)	图 0.0	=0.40.2	的文学與實際	275,4	<b>经验证证明</b>	<b>可是基本的主义等</b>	学生学学 !
Approach LOS		A - 1001, or some pay of a sufficient	er i om miljetyt er meg ergmiste geldet Stockhoe.	F		There is the first of the second seco	€ras kuat sile
ក្រី(Brate)ជាគោខាងម៉ាត្រីក្រីដូស្វែន			70/51 TV 1/24 TV	7-0			10 July 7 July 1
Average Delay		2.6					
Intersection Capacity Ut	lization	5.58.7%	音号 ICU Léve	of Service	PAR THE PARTY	ING THE STATE OF	
Analysis Period (min)	n sa un en die e veelege versphijde by	15	t in a restricted training and desired.	Marie Carlo Ca	ing, was the transfer of the second	क्षा अन्य का क्षेत्र के विश्व के स्वर्थ के क्षेत्र के क्षा का कि	and realist to be the second
<b>以来对对国际国际的基础的工程。</b>	HE 40 00 20 20 70 00 00 00	· 1777/2023年3月7月9日本市	克尼州 经双流通路线 网络沙海绵	<b>公司的公司,但是否是一次是一个</b>	E44次数据的电影中心线中心电影中心	arachia sev perch	tite - and he is a

		-	•	•	<b>←</b>		1	Ť	1	-	. ‡	4
aciele Choppie		Est	a a la c	WELL.	WBI	. Tylelet		NEE	an Belg	SPLA	SET	SEIR
Lane Configurations	ች	朴			44	7	4	4				
Ideal Flow (yphpi)	€19005	1900	1900	1900	<b>1900</b>	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	150 Telephone		9	学15副		9	15	建设强于	<b>多数9</b> 5	15	Y July 1	9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
所認識過過經濟學		<b>克特教</b> 定				0.850		0,932			Design.	
Fit Protected	0.950			On top office contain	_ a compa de milion am	endes enderende	0.950	0.974	i saudanaem <u>ini</u> neem	SALTAMENTE SITUS	er ere Namensa – ind	ni Caramana wa 1227
Satd: Flow (prot)	1770	3539	. E.Q.	1.0	3539	1583			沙罗0	<b>建定0</b> 2	0	0.2
Fit Permitted	0.950	. waxen.	rechercial action	ren van en marken		ino pelacina	0.950	0.974	79869 AM	merene eri	rugaya - Arda	n primara ang
Said: Flow (perm)	图1770	3539	等数0%	THE UNI	3539		168.	1606	是1000	声型 UE	0.0	A D
Right Turn on Red		, v generalije in	Yes	o vertendari		Yes 2.580			Yes	ACHTO PRINCE	GRANTEN SER	Yes
Said Flow (BTOR)		1.00	1.00	1.00	1.00	1.00	1.00	47 1.00	1.00	1.00	1.00	1.00
Headway Factor	1.00	1.00 	1.00	i.uu Maraan	1.00 編載 <b>30</b> 章			1.00 元型30章	1.00		1.00 字典 <b>3</b> 0章	
Link Speed (mph) Link Distance (ft)	图450000	650			244			835		all stillers	894	
Trave Time (s)		3.14.8%	HUZZE		题555			约19.02			20:3	
Volume (vph)	367	1362	0	0	884	923	397	1	117	0	0	0
Peak Hour Factor	對 0.92是	0.92	0.92		0.92	<b>20.92</b>	0.92	票0.92图	0.92	_		0,92
Adj. Flow (vph)	399	1480	0	0	961	1003	432	1	127	0	0	Ö
Lane Group Flow (vph)	399	-1480	Si Osi	NEW OF		£001		a 280 i			[2]	0
Turn Type	Prot	na samuy Asia da da sa	and affect of the second	egibalf. The elephon Elifa	in the period of	Perm	Perm	d Made Service Constitution of the Con-	Pagnannie by Jest 20. e	or and sometime, and the	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	subserve to the
Protected Phases	<b>营运7</b>	4.	型。四數		<b>8</b>			20	自己是	湖湖		
Permitted Phases	(), ()() + ne met/20	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				8	2					
Total Split (s)	<b>22.0</b>	୍ର 59.0 🤻	。0.0	0.0	37.0	37.0		置21:0章	學0.0是	經0.0%	<b>50.0</b> 3	0.0
Act Effct Green (s)	18.0	55.0	T-9720" . S. all annie.	Late some hervandevide	33.0	33.0	17.0	17.0	ac weyka 'enyment y	Hann Free Circles of A	antaka matusa.	Armanian Tuber
Actuated g/G-Ratio	₹ 0.22	0.69			0.41	041	0.21	到0.21期			全层限量	
v/c Ratio	1.00	0.61	er until militar museum sitte	rererenske.	0.66	1.01	0.78	0.74	overnesti.		ing the Alexander	Mark There Fills
Control Delay	79.6	图 8.0		拉黑拉	21.6	<b>43</b> 1	47.3	<b>887</b>				
Queue Delay	0.0	0.0 	range in the		0.0 21.6	0.0 43.1	0.0 47.3	0.0 38.1				**************
Total Delay	79.6£	Kentungen der	Rich All		12	D	=+432 D		加制通过		种数压力	nt suc
Approach Delay	E Enverter	A 23.2	50.000 Miles	Tally and the	C 32.6			D 数42.7章			<b>医</b> 图1199	TO THE
Approach LOS		C			C			D				
Stops (vph)	309	<b>集666</b> 薪			682	410	225	1924	#304V-#			STATE OF
Fuel Used(gal)	10	16			9	12	5	5	DS MEN SE	randerfor, es p	994) 2552 CARA	<b>後があるが。そそら</b> 様
CO Emissions (g/hr)		1123			653		<b>378</b>	3315			XIIVE	
NOx Emissions (g/hr)	141	218	يَّة سَانَ مُسْتَنَّقِ مِي الْمُسْتِكِينَةِ الْمَلِينَةِ اللهِ سَانَ مُسْتَنَقِقُ مِي الْمُسْتِكِينَةِ المُسْتِ	an amplement of the	127	165	74	64	N 36 11 7 12 12 12 12 12 12 12 12 12 12 12 12 12	mi_wil Did Swetceshiller	Mg Tau, w. Linning at a	m = ) }
VOC Emissions (g/hr)			校制证		1513	<b>77196</b>	88	77		Name of the		
Dilemma Vehicles (#)	0	0	amar doctor fo	THE PERSON NAMED IN	Ō	0	0	0			ES Phinished , hardway as	d warm define their
Queue Length 50th (ft)		差177倍			a 197	<b>4278</b>	CALL PROPERTY OF THE PERSON NAMED IN	國 14章			學是表現	
Queue Length 95th (ft)	#378	231			263	#578	#267	#234		12 1		
Internal Link Dist (f)	路配置	<b>570.</b>			64			755			# <b>814</b>	為語差
Turn Bay Length (ft)	briefel ber 1 1 1 1	المراجعة الأمامية وموا		14-4 or buly - 0 or s-0-0	معروب المحمود المعروب	mans I - Total		erin kalen er er er er	والمستوال والمستوال والمستواد		e e e e e e e e e e e e e e e e e e e	n esperimente d
Base Gapacity (vph)	398		随便能	過煙	A same with the same	an annual of the state of		378	STEPPED	到經營城		<b>HEALTH</b>
Starvation Cap Reductr	n 0	0	,		0 	0	0	0	erapantanini	ya angendar	negerinasa es	uzezaren er
Spillback Cap Reducting		the second second	海道		O D				<b>Establis</b>		da na	AL PART
Storage Cap Reductn	0 ************************************	0 ********	teantentaria		0 0.66	0 =1:0:12	0 *********	0 *********	nest kastnesses		ndenes e	only one
Reduced Vc Ratio	1.00	EU.D.			<u> </u>		EU.(D)	型U.(4)			a PEGAR	
	Control Carlo and man Carlo and Carlo Carlo and Carlo Carlo			The second second second	NEW YORK PARTY OF	AND DESCRIPTION OF THE PARTY OF THE PARTY.	COMPRESSOR OF STREET	The state of the state of the state of	STREET,	CONTRACT COMPANY		Carlotta Machania (St.)

Area Type Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:, Start of Green

Control Type Pretimed Maximum v/c Ratio: 1.01

Intersection Signal Delay 29.9 Intersection Capacity Utilization 102.1%

Intersection LOS; C ICU Level of Service G

Analysis Period (min) 15 ~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles

Splits and Phases: 3: S 188th St & I-5 NB Ramp

<b>1</b> p2	<b>→</b> ø4	W.	
	. <b>≯</b> ø7	<b>4</b> <sup>®</sup> - ø8	
	CAPACIONES CONTROL DE LA CONTR	2745 AND AND SHEET AND SHEET	

	۶	<b>→</b>	$\searrow$	*	←		4	<b>†</b> -	<i>&gt;</i>	1	1	1
arinizalGire(b) place with the left	& (E-E) L	. Earle	<b>医</b> 图	Wals	AWENE:	Wale	e in Ele	and Birds	e Ne)re	alsis.		al SIBIR
Lane Configurations	ኘ	ß		ካካ	ĵ.		*1	<b>ተ</b> ተ	7	*	ተተጉ	
Ideal Elow (vphpl)	1900	1900	1900		1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Tuming Speed (mph)	15		9	15		9	15		. 9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Fit主動的企業與例如	经最高	0.992	ي وقت - ان		0.965			<b>经营业</b>	0.850	TO THE STATE OF	0.996	BURE.
Flt Protected	0.950	or subject to		0.950	ente a managemente de	i Mariane estat un	0.950	e a marinal sa tabbas	. etc. water taken	0.950		
Said: Flow (prot)	The sale and the whater	1848	. 0.4	3433	1798	為 0	1770	3539	1583		5065	<b>基于10</b>
Fit Permitted	0.950	e a diamenta	: : <b></b>	0.950	er a maria da del .	in the States	0.950	المتابعة عساطة تكوالا	oons salaasin.	0.950	والمستحددة والمستحددة والمستحددة	enateratus
at the best of the parties of the pa	17705	1848	E CANADA MANAGEMENT	3433	§1/983	· b." (150 d. 1.150 de 15);	1770	13539	1583	1770	5065	
Right Turn on Red	G.Maniretti		Yeş	e ergenne grænne	ಕ್ಷಣ್ಣ ಎರಡು ಕ್ಷಣ್ಣ ಎರಡು	Yes	en e	area de la	Yes	narentrett	gangnga Jawa	Yes
Sald: Flow (RTOR) Headway Factor	1.00	1.00	1.00	1.00	またとう。 1.00	1.00	1.00		298 1.00	1.00	1.00	(2460) 1.00
Link Speed (mph)		1.00 1.30			1.00 発養 <b>30</b> 学	1.00 定項數配		1.00 25.30	T.UU EEFFEEE	UU.T Leeting	1.00 4年 <b>3</b> 0年	
Link Distance (ft)	RESERVED.	1070		निक्रियात	798		国际中心	306		Carrier Contract	408	
Travel Time (s)	A. Talakan	24.3			7.50 劉 <b>昭</b> 第			SA7.0	2-20		9:3	Zi kete
Volume (vph)	15	128	ਹਾ-ਅਜ਼ <b>ੋ</b> ਲਪੈ <b>7</b>	379	280	86	71	635	274	103	1167	34
Peak Hour Factor	<b>0.92</b>	T0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	139	. = = = = = = = = = = = = = = = = = = =	412	304	93	77	690	298	112	1268	37
Lane Group Flow (vph)	16		∵ <b>o</b> ∵	412	397	- R. O.	<b>验77</b> 流	690	298	∭112-	1305	· / 0
Tum Type	Prot	C. Tea Superiff (C.)	ige total 1 gelderal	Prot	egen, Sylvator Seer Section 2	Same of Harman Mary and 1 . P. C.	Prot	्रीतिक के कार्यक्रमा के <sup>क</sup>	Perm	Prot	Care encoder	2 (44)
Protected Phases	## <b>7</b>	4		- 1. <b>3</b> 7	<b>8</b> .	<b>美国基本</b>	<b>科里5</b>	湿。			6	
Permitted Phases				***************************************		Carried NC 2 Las			2		4. 12.61	
Total Spir (s)	图.0	20.0	0.0	15.0	27.0	0.0	9.0	24,0	24.0	11.0	26.0	0.0
Act Effct Green (s)	4.0	16.0		11.0	23.0		5.0	20.0	20.0	7.0	22.0	
Actuated g/C Ratio	<b>0.06</b> 。	<b>0.23</b> /	P. V. ARE	0.16	0.33	計學等時	40.07	0.29	0:29	0.10		
v/c Ratio	0.16	0.35	Januar widenma	0.76	0.66	mer en kalment en h	0.61	0.68	0.45	0.63	0.82	e ore or
Control Delay		24.7		39.3	200-00-00-00-00-00-00-00-00-00-00-00-00-		54.4	26.3	512	48.4	27,3	<b>学出来</b> 《
Queue Delay	0.0	0.0	er and case	0.0	0.0	ia di Sarania	0.0	0.0	0.0	0.0	0.0	CHETTALAN.
Total Delay LOS	第35] 1	24.7		39.3	And the families with the		54.4	26.3	※52%	in the property of the second	27.3	
	D Tarenta	25.8	nga kara	D Second	C 832.3		D Transporter	C 22.4	A Ustanie	D Herensen	C Toolog	Material (1)
Approach Delay. Approach LOS	可分類的	<u>ئىدى.و.:</u> د	ii qadir.b		₹32.3 °C	金钱的		£ <<.49			28.9	
Stops (vph)	2 18 18 E	AS INTEST	TE THE	<b>※34</b> 7學	_		63	強に不認	第134营	100°	U PHOXES	N TANK
Fuel Used(gal)	0	2 MHARIA		などもはは	配 <u>と</u> 00章 6		2 - C	11	3	نستان 2	16	L. Parine
CO,Emissions (g/hi)		煌168 <b>署</b>	G:SEARS	_508	_				_	_		
NOx Emissions (g/hr)	5	33	ecept com	99	78		23	151	34	25	221	PERLA
VOC Emissions (g/hr)									## A1			
Dilemma Vehicles (#)	0	0		0	0		0	0	0	0	0	W. Links
Queue Length 50th (ft)		\$ 52 <u>2</u>			数135零							THE C
Queue Length 95th (ft)	25	100	eri Samapalir	#149	226	THE PARTY AND ADDRESS.	#92	194	52	#114	239	Type and a
		990			<b>是7.18</b> 編						328.	
Turn Bay Length (ft)	- Control of the Column	۱۹۱ ها ۱۳ <u>۱۲ کا ۱</u> ۹۱۵ کا ۱۹۱۳ مند	- Athena Garage S	······································	a en 48=€23=€40 - 44 e€5 - 12	IN THE STREET	usansta Mirkid i iji		en amendest elek	a reigium gen ig	Carl with method to the	<sub>-</sub>
Base Cápachy (vph)	2101	425		<b>539</b> ×	606為		第126第	10112	665	177	£1596	
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	
Spillback Cap Reducting	<b>三三</b> 0	黑0個	医病	經過0點	是指10影		體級O開	100多	<b>多是0</b> 多	经常0定	<b>沙湖(0</b> )	1975.41
Storage Cap Reductn	0	0	2 (	0	Ö		0	0	0	Ö	0	
Reduced V/c Ratio	.O. [6]	<b>20.35</b> E	E HE	0.76	0.66		0.6	0.68	0.45	0.63	0.82	

# Lanes, Volumes, Timings 10: Military Rd S & S 188th St

#### Intersection Summary

Area Type Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed Maximum v/c Ratio: 0.82

Intersection Signal Delay: 27.6

Intersection LOS: C

Intersection Capacity Utilization 63.9%

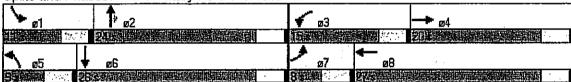
ICU Level of Service B

Analysis Period (min):15

nalysis Penod (min) 15 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles

10: Military Rd S & S 188th St





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Novement and the second			Em SW/Reading and	ace confice was a configuration of the	
Lane Configurations	<b>ት</b> ጉ	ሻ ቀቀ	ኝ የ		
Sign Control	Free	Free Sto			<b>护力探索</b>
Grade	0%	0% 09	<b>/</b> o		
Volume (veh/h)	1753 0		<b>0</b> ₩ 0		
Peak Hour Factor	0.92 0.92	0.92 0.92 0.9		•	
Hourly flow rate (vph)	-, 1905	0 1570	0 🚣 0/ 🦠		4, 47
Pedestrians					
Lane Width (ft) 题籍:					
Walking Speed (ft/s)		na di malai ka	and the second s	The second of th	
Percent Blockage	<b>建</b> 等。	1. 第二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十	3. 其其种种类的特别。		
Right turn flare (veh)	ggang na ana panthan tang na mga na hiji nggang	o salo, nga <del>nga pambana na nagang pang nga pang pang pang pa</del>	menade en perade de la como en contra de la como	ر در ۱۳ م در در ۱۳ در در در در میشود و را بر در	and the Application
Median type		Non	e de la companya de l	THE STATE OF THE S	
Median storage veh)	Notes and the first operations of the contract	on organization and material and assets the second	e diremente explus avasantentario de	。在1986年,1988年-1989年,ARKAR (1988年)新華華州東京的東京中華(1	winderproperty and
Upstream signal (ft)		244		经产品的 医胃毒素	17.0000
pX, platoon unblocked	entropo Annologico de Mario	0.7	6 0 - 953		Marie Britis
vo. conflicting volume	體和可以為其對於	1902 F 5 X S 9	Unite 953 将关键	de andere en	
vC1, stage 1 conf vol	eren berlande eta ila beterria.			如,可能是否的智力和特殊。 第二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十	T. 1241.5 (3)
vC2, stage 2 cont vol		1905 290	6 953	提出。 1985年 - 1985年 -	1. ng. + 1
vCu, unblocked vol tC, single (s)	HEART LOST LANGUES AND SENSON		894694		4,73970 v.113
tC, 2 stage (s)	<b>通报,我们是否不同的问题</b>		Clear U.S. Francisco		
tE (s)	MANAG MARINASAN	222 3	5 33		30, 30, 30
p0 queue free %	HANDER OF THE PROPERTY	100 10		िकार के दिल्ली की सद्धार्थ के लिए हैं कि कार में सम्बद्धियाँ के क्षेत्री के क्षेत्री के क्षेत्री के क्षेत्री क विकास के स्वर्ण के किस्सी के स्वर्ण के किस्सी के क्षेत्र के स्वर्ण के स्वर्ण के स्वर्ण के किस्सी के स्वर्ण के	
cM capacity (ven/h)	期間をデスタを開発	308	91626079111		
TO WELL HIS ALTO CONTROL OF THE PERSON OF TH			Transfer of the second of the wife and the second of the second of		e translation in
Directions and the same	體NB別數的B2副	SBMESSBEENSB			
Volume Total	第1270章 635章	0 785 78			陸和阻認
Volume Left	0 0		0 0 0	መመደመታልት ነገር መደን ነነሱ እንደ የመደመጀመር ነው ማመው ምህ ነው ነው።	angetskoeterhet
Volume Right	<b>整整0.25毫0</b> 5		0.5550354035	<b>了</b> 然是这个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一	
cSH		1700 1700 170			STATE SEASON
Volume to Capacity		(Seconda, myselfithigus (Sept); methyral fariya, yangamentiy ong		語於是理解的問題的問題的	题为给据
Queue Length 95th (ft)		O O ≦0.0素≈0.0ෲ≥0.	0 0 0 0 0 0 0	等特别的"Sundaya",可是特別是實際的	Party Extended
Control Delay (s)	<b>建设0.0%</b> 0.0%	O'O'O'BEE O'O'SE'S O'	USES U USE U USE A A	<b>创造文字等但,是1957年的发展的关系的工作之</b>	
Lane LOS				<b>被据证据实现要证据性的</b> 证据的理解的	######################################
Approach Delay (s)	MAR N. WALLES	+ y.v.streamous	A A		<b>的基本</b> 自由的
Approach LOS					
interestion fundative					
Average Delay		0.0			and the second second
Intersection Capacity U	Itilization 1886 5	ح سياب سنب مساوره . اولا م المساولون اورو ( محمد م	evel of Service	理學等語為學習語言學	年过多心
Analysis Period (min)		15	r p. j. je- hady g. j. pykajagna, gang j. bisa andon adam te saken andon an o	flagger_geroon/affigeringly-g-geringgeringgrappy (200 new date in its tensor an enter 1800.) . v	a belong entropy more than the
即是建筑的				可然可是對時間的問題	是其為於

	· )	<b>→</b>	· •	•	4-	· 4	-	†	-		<b>↓</b>	1
HEIRE CIROLETT			EBR	#Wicle	WE THE	WBR	NE		MEIR	y selo	e Sizile	e e e
Lane Configurations	*	<b>ተ</b> ተ			朴	7	1	€}>	e for			- 17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900±	1900	1900	1900-	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15	121	9	15		9	: 15∌	7 4 T.	9:	15		. 9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Friedrich State (1987)	· »: , .	1 (1 m + 1)		والمنافع المالي	· · - : ' · · · .	0.850	4.1	0.936				
Flt Protected	0.950						0.950	0.972		in Britain Ann anns		
Satd. Flow (prot)	1770	3539	0	0.	3539			1610	₹ 0	⇒ 0	. 0	0
Flt Permitted	0.950		*		10 1000 1000		0.950	0.972				
Satd. Flow (perm)	1770	3539	0		3539	1583	1681	1610	1438 O	<b>.</b> 70	0	0
Right Turn on Red			Yes			Yes		T LAND COLUMN TO	Yes	,, n		Yes
Satd. Flow (RTOR)	内质点 4			<u> 5</u> . 507		.580	心中情况	42				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		<b>30</b> %	o sign	The state of the s	30.		计可能定	30			30	524.89 7 124.99 12.
Link Distance (ft)		650			244			835	12.1		894	
Travel Time (s)		14:8		T THE PERSON	5.5	可是是	<b>多洲形</b> 鸟	19.0 f	775	<b>建设的</b>	<b>~20.3</b>	灣海馬
Volume (vph)	367	1362	Ó	0	874	912	397	1	107	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0,92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	399	1480	0	0	950	991	432	1	116	0	0	0
Lane Group Flow (vph)	399	1480	0		950	991	276	273	. 0	0 / 60 / 7	0	0
Turn Type	Prot					Perm	Perm					
Protected Phases	7	4		·	. ∜. 8∜	File S	1	~~ <b>?2</b> ~				
Permitted Phases						8	2					
Total Spit (s)	22.0	59.0	0.0	0.0	,				<i>ૢ</i> ૽0.0 ૄ	0.0	0.0	0.0
Act Effct Green (s)	18.0	55.0	Ok. Littari	. a.e. e	33.0	33.0	17.0	17.0	ti len ekitta	er spillige et a		J**
Actuated g/C Ratio	0.22	0.69	100		0.41潭	0.41	0.21	0.21				
v/c Ratio	1.00	0.61	الا تقسد ما	name na -	0.65	1.00	0.77	0.73	eng La summa	t de gerden		• • • •
Control Delay ೌನ	79.6	8.0	المنافعة المالا		21.5	39.9	46.3	37.8	色制的	"点场"	40	i a volati - Transacti
Queue Delay	0.0	0.0	et see Little met	a strongstrat	0.0	0.0	0.0	0.0	Yet Balder early	ra i statistica e i re	arazen	ng inggegerie
Total Delay	79.6	្ន់ <b>ខ្វី.០</b> ្			The Principle of Labour.	39.9		· •		計劃的		
LOS	E	A ™odiati	rgagion de s	in Markagan sang	C	D a annumen	D HANKAKAN	D	PLES BY HALS	in distribution	antina Nas	a ye dilike
Approach Delay		23.2			30.9	5903500	P. F.	42.1		PHEN		134 374
Approach LOS	merdade.	∵ಪಂದರ್ಗಳು	an time	ారాశాడల క	U Stanasi	402	M.H.AASS	U Bernaden	Balanten 199	200 <b>25</b> 6.4.0	en el Monados	w.,
Stops (vph)	309	666	Tarin William		A TO A SEC AND A PROPERTY			199°	ar E.≩	1. 种植。		
Fuel Used(gal)	10	16 ⊶4300**			9 ∹c/o‱	11 進 <b>794</b> 題	5 ≅465≅	ວ ≊ann≃	Wilderstein (14)	ere francisco	<b>建设设计。"</b> "是"	rendek
CO Emissions (g/hr)		218		with the	125	155	72	63	K. C.			
NOx Emissions (g/hr)	141 ਕਵਾਬਰਤ		mayeris (Siri	<u> 단말</u> 당당 및 15명					学的数据结合	Windshift of the second	Ser de la companya d	U. LUMBLE
VOC Emissions (g/hr)			il line	S. Landing	0 1452						A SEPTEMBER	i vita i i i
Dilemma Vehicles (#) Queue Length 50th (ft)	0 ಚಿಕ್ಕಗಳು	0 ボイフカジ	NI TYPE	ing salahan Tagan	194	O Septimon of the contraction of the	0 83.033	0 图1333	CHROSTEN (	" 第四四条章 公	24727	\$1.400.8
Queue Length 95th (ft)	#378	7€31 231	Minaal	. 2. 可益等	258		#261	#229				HE HE
Internal Link Dist (ft)			) 14871884	1435H 443					SARSAY			77 MY 1
Turn Bay Length (ft)	<b>建新疆,西</b> 斯曼	7.7.03		松 多距 阻塞	AS TANK	是就是原理					5-1811.0	
Base Capacity (vph)	90p"	€ 03400°	<b>第5款 图 表集</b>	· 李孙公子 李	1460	SEKOÖ∗€	変えて大変	※タフロ は	LUCIO CONT	Section 1	righter.	-अन्द्र हो ह
Starvation Cap Reductr		." <del>⊂455</del> 16	er en skald	ar a Rich	の <b>30.390</b> 節 0	0	0 をおばな	0 0	特温特尔河	MINISTER I	រីស៊ីតនេះ -	
Spillback Cap Reducting		_	green a	7.0055000		_			<b>阿尼斯斯</b> 尼斯		gjasta, Mal	. (M) ( 1 m d.)
Storage Cap Reducting	38 382 <b>9</b> 25 <b>0</b>	0		Sagrad China	0	0	0 0		abusi.i	me I al	Nana-A	MATE A
Réduced V/c Ratio	-	_	grander.	ing grant in	0.65	_	_	_		<b>可以接近</b>		સુધવારનું કે
i teduced we land	R. LAYME		Probabilit	della della d	F4.77	EL.YYY	British C			alester!	eruder Elek	4.28***********

Area Type Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:, Start of Green

Control Type: Pretimed Maximum v/c Ratio: 1.00

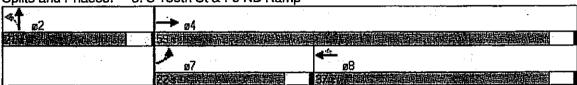
Intersection Signal Delay 29.0 Intersection LOS C
Intersection Capacity Utilization 101.1% ICU Level of Service G
Analysis Period (min) 15

 Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles

# 95th percentile volume exceeds capacity, queue may be longer.

Quelle shown is maximum after two cycles

Splits and Phases: 3: S 188th St & I-5 NB Ramp



	<b>)</b>	· · · · · · · · · · · · · · · · · · ·	*	* **	<b>—</b>		1	†	1		<b>↓</b>	1
ano ciono	ERL	BEBIE	WEBRI		WEIR	WEIR		Men	MBR			SIELE
Lane Configurations	· • •	<u></u>		77	<b>-</b>		*	ተተ	7	1,	ተተኑ	- 1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	√1900∌	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9.	: 15			15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Fit 1		0.992	11.5	·	0.965				0.850		0.996	y. • (1)
Flt Protected	0.950	:	•	0.950	•		0.950	· ·	-> <del></del>	0.950	e de la companya de l	12
Satd. Flow (prot)	1770	1848	0:	3433	1798	:: <b>0</b> ;	:1770	3539	1583	£1770	5065	0
Flt Permitted	0.950	• ाता कर	·	0.950	·,		0.950	A British No. 4	That's at the	0.950		
Satd. Flow (perm)		1848	Ö		1798	::	1770	3539	1583	1770	5065	0
Right Turn on Red			Yes		11. Pro 11. 11.	Yes	the free street is the	10	Yes			Yes
Said Flow (RTOR)		. 4	4	11. 3.0	23		<b>完整的证</b>	1. 1. Co.	298		- 6	4 (3.5%)
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)	Section (Alberta	- ∄30		13.15%	30		的影响	30			30	
Link Distance (ft)		1070			798		11 11 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	306			408	
Travel Time (s)		24.3	W 19 1	) AND	<b>7.18.1</b>	是明治的特	电影子的	7.0		<b>阿里斯斯</b>	9.3	9 4 4 5 5 6
Volume (vph)	15	128	7	378	280	86	71	630	274	103	1165	34
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	÷ 0.92	0.92	0.92	0.92	0.92	0.92
Adi. Flow (vph)	16	139	8	411	304	93	77	685	298	112	1266	37
Lane Group Flow (vph)	16	147	0.	41.1	<b>397</b>	- TO:	1 × 778	685	298	112	1303	` <b>`</b> 0
Turn Type	Prot	The Contract of	* **	Prot	a server a series	* * v-v	Prot	1 .pm 4°4°	Perm	Prot		
Protected Phases	···:7	4		- 3	8 :	THE FORES	5 <b>5</b>	2		::::5° <b>:-†</b> :	6	
Permitted Phases	***							1 1 2.,201 %.	2			
Total Split (s)	8.0	20.0	0.0	15.0	27.0	0.0	∮. 9.0∛	24.0	24.0	11.0	26.0	0.0
Act Effct Green (s)	4.0	16.0	<i>"</i> • •	11.0	23.0		5.0	20.0	20.0	7.0	22.0	
Actuated g/C Ratio	0.06	0.23		0.16	₫ 0.33		₩ 0.07	0.29	0.29	0.10	0.31	0,7%
v/c Ratio	0.16	0.35		0.76	0.66		0.61	0.68	0.45	0.63	0.82	
Control Délay	35.1	- 24.7	4 15,000	39.1	<b> 25.0</b> /	100	£ 54.4	26.2	5.2	48.4	27.2	
Queue Delay	0.0	0.0		0.0	0:0		0.0	0.0	0.0	0.0	0.0	
Total Delay	35.1	24.7_	ing and the second seco	39.1	25.0	经营业	<b>₹54.4</b> ′	26.2	5.2	48.4	27.2	
LOS	D	C		D	C		D	С	Α	D	C	
Approach Delay		25.8		n in the second	√32.2	数是更是	<b>新种种</b>	22.3	<b>对语言</b>	<b>长持数</b>	<b>.</b> 28.9	
Approach LOS		C			Ć			C			C	
Stops (vph)	18	<b>107</b>		340	288		63	.535	34	93	1043	2019/50 3015 氢 4
Fuel Used(gal)	0	2		7	6	•	2	. 11	3	2	16	
CO Emissions (g/hr)	23	168	Sin <i>da</i> ≓i	506	400	图2222	116	770	176	130	هند تلت معرده و وه . و	
NOx Emissions (g/hr)	5	33		99	78		23	150	34	25	221	
VOC Emissions (g/hr)	5	39		117	93		强整27建	益178	. 4 I	5.÷30	- 263	。 《香花》
Dilemma Vehicles (#)	0	0		0	0		0	0	0	0	0	
Queue Length 50th (ft)	7	. 52	etini in Kalanda	<b>7 88</b>	135		33	136		47	186	
Queue Length 95th (ft)	25	100		#148	226		#92	192	52	#114	239	
Internal Link Dist (ft)		990		非理解	718	學是是	经基础重	226	是是是對	學問題	328	May 1
Turn Bay Length (ft)	A	* 2*									•	
Base Capacity (vph)		425	新加热	539	606		至126点	1011	665	177	1596	
Starvation Cap Reductr		Ô		0	0		0	Ô	0	0	0	
Spillback Cap Reductin		and the party	利的な対策	SEE SIN	3 20	<b>等数学是</b>	STATE TO SEC.	経際の	验护罗 <b>O</b> 。	结约点的	<b>∵0</b> .	
	0	)`∷. <b>U</b>		150 P (150 P)	5 4 5 ST W	U. J. 1965	10 C C C	_ DOM: NO. 1		1.3	15	
Storage Cap Reductn	원 (1 <u>.03</u> 0	0 0		Ö	0		0 ∛0,61≸	0	0	0	0	

Area Type: Other

Cycle Length: 70

Actuated Cycle Length 70
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed Maximum v/c Ratio: 0.82

Intersection Signal Delay: 27.5% Intersection LOS. C. Intersection Capacity Utilization 63.8%

ICU Level of Service B

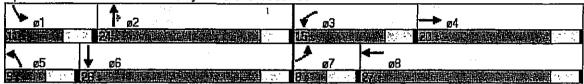
Intersection Capacity Utilization 63.8% ICU Level of Service B

Analysis Period (min): 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles

Splits and Phases: 10: Military Rd S & S 188th St



	1		*	1		* <b>L</b>	1	†	1	-	Ţ	1
Lana China Chi	AND THE REAL		EBR	<b>WEB</b>	AWERIS	AWBIE!	54 <b>2131</b> 4	and the	NEEN	STELL	(4) (4) (4)	45121
Lane Configurations	· <b>%</b>	<b>^</b> ^			<b>^</b>	7	ኘ	€}-	nja sili n	116.6		1.194
Ideal Flow (vphpl)	1900		1900	1900		1900	1900	1900	1900	1900	1900,	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15	. Companie.	9	15		9	15	A SA SA		15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt. die Alle 1985						0.850		0.930	83 7 E			
Flt Protected	0.950					ari e ge	0.950	0.974	1. 4.		suggi të	
Satd Flow (prot)	1770	3539	0	0	3539	1583	Contract Cable and the	1603	0	<b>0</b>	0	0
Flt Permitted	0.950	eria alteriore	ere i i i riint	en e	دور افور مداسم مداسرات	en e	0.950	0.974	on and server	in the same with the same of t	es es se s	·
Satd: Flow (perm)	1770	3539			3539	A SHARE SECTION	1681	1603	4570F	了特层 <b>0</b> 至	* <b>0</b>	* : <b>*</b> 0
Right Turn on Red	nunganyan ya sasi asas s	թյունայ, թե բալույ	Yes	्रम् स्थापनायः । ५१	ing one of the state of	Yes	matical designation (	an and Laboration	Yes	나라네 중요공기	Vacetyr	Yes
Said: Flow (RTOR)						<b>544</b>		168	的知道是可		a (1830) 56	
Headway Factor	1.00	1.00	1.00 Satista	1.00	1.00 അത്ത്	1.00	1.00	1.00	1.00	1.00	1.00 30	1.00
Link Speed (mph)	Constitution of the consti	30	F Will	2.4. J. 4.	第30章		<b>并以</b> 其代数表示	230差	ul tra	是可担法	894	in the latest
Link Distance (ft)	the tracking	650 14.8		National	244 5.5			835 ∳1 <b>9</b> .0∮		ame Salami IV		ana Walio
Travel-Time (s)	556	2064	147 7342 0	(4) 2 2 2 3 3 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	າວ.ວ <sub>າ</sub> 1340	1399	602	·//19.0	177	0 0	,,, <u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>	₩₩₩ <b>∩</b>
Volume (vph) Peak Hour Factor	0.92	2004 [0.92]	0.92	0.92	0.92		0.92	0.92	0.92	: 0.92∑		∷0.92
Adj. Flow (vph)	604	2243		. v. 32.	1457	1521	654	. 0. <i>32</i>	192	0.0	0.02	0 50.55
Lane Group Flow (vph			785 D.S	ଟ୍ଟେଲ୍ମ । ଜ୍ୟୁଲ୍ଲ ପ୍ର		1521		409	·····································	See O	ระว่ากับ	}
Turn Type	Prot			(1) 11개 특히	ह इ.उ.स.च्य	Perm	Perm		The second		THE CO	PARA SE
Protected Phases	多三字 <b>7.</b>	GRA4	gita i gga		8			2		in the	2-5123	
Permitted Phases	#artis as figu	্র-প্রতিকর্তা শাসীরার	in the second	Fall a model of	enin samu	8	ышыны ы. <b>2</b>	E (REMARKETAR-	Coll Made Assista	Charles while an	a Talendaria	a same
Total Split (s)	33.0	98.0	0.0	0.0	65.0		32.0	32.0	· 0.0	\$ <b>0.0</b> 0	0.0	0.0
Act Effct Green (s)	29.0	94.0	a five in the en	wasing to be 12"	61.0	61.0	28.0	28.0	1.15	d 11 1		
Actuated g/C Ratio	<b>© 0.22</b>	∌0.72≟	过巴加克		0.475	0.47	0.22	0.22	<b>运动的</b> "	<b>海</b> 病节		
v/c Ratio	1.53	0.88		and the second section of the second	0.88	1.47	1.21	1.14				
Control Delay	285.8	18.9	<b>医毛霉素</b>		38.5	239:1	161.9	136.0				
Queue Delay	0.0	2.6			0.0	0.0	0.0	0.0				
Total Delay	<b>285.8</b>	21.4%	曾整理		† 38.5g	239.1	161.9	136.0	A MARKE			
LOS	F	С		n and a supplementation	D	F	F	F	teacher destinations	a. Three is made in the	a materials	raija, wa
Approach Delay	Step 9	77.5		12, 174,	141.03	網問題	<b>第0</b> 基	149.4	iceolo II. a	i. Trina	เราะ เมาะ	3-7-4-
Approach LOS	nda —aperienda — hafine ti	E	rindt fledti	الواحرة كيواء بطويدان	F	an billi diye.	6980 A 1474	F	. Transpalet in	TO SEED SEED OF SE	erina esta esta esta esta esta esta esta est	and Stoff face
Stops (vph)	The state of the s	1505	<b>新</b> 斯特	道是是自	,		327				grandist to militaria. Tali Belanda	が必要に
Fuel Used(gal)	39	32	eret Transforms Sa	i <del>Talanta d</del> a sentas	19	75 	18	15	24個語言發展問題	ri <del>adayan 19</del> 5-	enge estençen err	ere retar
CO Emissions (g/hr)	湿 2706	2211		特别是	<u> 1961</u> 的	5230	124 ]	到015世		(明显)		
NOx Emissions (g/hr)	527	430	residente de la compa	industria in a secon		1018 *********	241	197		Marka (1905)	STEEN HELD	TIMBALKI TIMBALKI
VOC Emissions (g/hr)	<b>349.05</b> 亿		<b>開作。192</b> 5年		F.3 [3]	記と1名 0	0 2001		定有核心的	ALMS TO BI		THE PARTY
Dilemma Vehicles (#)	0 इन्डिस्टर्स	0 (2040)	randami	anger te state to	0 *** = 70%			0 #20FK##			a-reading	<b>元期間高</b> 至
Queue Length 50th (ft)	#041	805			2 270	#1702	#694	#622	Chieffe	15990 12 to		THE SER
Queue Length 95th (ft)	#941		EFERS.	arlanken A					Marie Co.			
Turn Bay Length (ft)	100 回报点证		ik 1.3 气量型	<b>经国际国际</b>	ALL LANGE	12年12年			resultation of			CERTAIN
Base Capacity (vph)	a aor	2550			1661	91022 R	<b>≅362</b> ≅	* 358 ×	29期受得4			TE STATE
Starvation Cap Reduct		209	ar.eneneed	<b>数据</b> 分析的	چيون 0	ر 0	0	0		CASCALLY A	asteration)	e de Calabraio
Spillback Cap Reducting	ii Barine na		<b>在</b> 三条形式							计图别		11245
Storage Cap Reductn	0	0	FFU, MGCS	Parental Security	0	0	0	0	en de la company de la comp La company de la company d	nelari di	大学の発生が	enath Pat
Reduced v/c Ratio	25 153 A										Z III GO	
			er e	artio-divini	en en vener				angareteng);	THE DESCRIPTION OF STREET	athra an Tal	erenantere.

Area Type: Other

Cycle Length: 130

Actuated Gycle Length 130
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:, Start of Green

Control Type: Pretimed Maximum v/c Ratio: 1.53

Intersection Signal Delay: 115.0

Intersection Capacity Utilization 149.6%

ICU Level of Service H

Analysis Period (min) 5

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles

Splits and Phases: 3: S 188th St & I-5 NB Ramp

<b>1</b> p2	→ ø4	* <del>*</del>		
GREAT WAR IN THE SECOND SEC				
	<b>9</b> 7	•	ø8	 . *
		<b>6</b>		

	*	<b>→</b>	$\gamma$	<b>*</b>	<b>←</b>	K	1	<b>†</b>	1	1	1	1
Lare Citation (Sales Sales	MEBLA	WEBIR	as Bal	WEL	<b>AWBITE</b>	WBR		ANENT!	SINBER	SEIL	4831	SBR
Lane Configurations	ሻ	Þ		ሻሻ	þ	. *	*	个个	7	7	ተተ <sub>ጉ</sub>	· · · · · ·
Ideal Flow (vphpl)	1900	1900 ∺.	1900	1900	1900	1900	19007	1900=	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	. 15		9	15		.9	15		. 19	河15	(1) <b>(1)</b> (1)	<b>9</b>
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.91	0.91
FILE		0.992	热質化	是整體的	0.965	ings of the			0.850		0.996	, ,,
Flt Protected	0.950			0.950		1 1 1	0.950	: 1112		0.950	. 1 4 1 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ng Nasian Tanàn
Satd. Flow (prot)	1770	1848	· . 0	3433	1798		1770	3539	1583	1770	5065	, F, 7- <b>0</b>
Flt Permitted	0.950			0.950	etern a tätern	i je sa	0.950		e market en de desert	0.950	gradien de la Colonia. Production de la Colonia d	a industrialism
Satd: Flow (perm)	1770	1848		-3433	1798	attendament of the	1770	3539	. Literary very	1770	5065	等接 <b>D</b>
Right Turn on Red	samalar i		Yes	SS A SSORTER A	num Continental Austr	Yes	web areases	with an farante an	Yes	formenskimter m	etta z aretaiten	Yes
Satd: Flow (RTOR)		: Z.3.			生 18 全	對這個整治		THE THE	<b>45</b> 18	学体说:	6 · ·	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)	八直至時	. 30		可能能精構	30	是 经通	是從數值	30			30	
Link Distance (ft)	ः तोतः <b>१५५८</b> म्युक्त	1070	edavetet storio	e vertingen	798	on established		306	ularen erren e Erren erren er	Salanian A	408	ાં ભાષા કૃષ્ણકો કૃષ્
Travel Time (s)		24.3	也是		图1851点			是7.03			9.3	
Volume (vph)	23	194	11 ***********************************	574	424	130	108	962	415	156	1769	52
Peak Hour Factor	0.92	<b>,</b> 0.92	0.92	0.92		0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	211	12 歌作 <b>的</b> 思	624	461 602	141	117 ≕ਕਬੋਤ	1046 1046	451 翌451第	170 ⊛170∄	1923 1980	57 (1850
Lane Group Flow (vph)	25	223	1911 <b>U</b> E	624	E DUZK	時形。UP	11 <i>7</i> Prot	JUHOS		Prot	ຳລວດ	E-SEM
Turn Type	Prot	1.8 <b>%</b> &	normalist (	Prot	TO COM	in Addans	FIUL	ATTA D	Perm	FIUL RESERVACIO		. 1872 <u>m</u>
Protected Phases Permitted Phases	Dig val	1.7.4%			in at Off	FATTER.	1874 <b>9</b> 16	13 <b>6</b> 6			. S. J. O.	
Total Split (s)	8.0	20.0	0.0	21.0	33.0	æn'n⊕	10.0%	36.0	36.0	<b>#13.0</b>	39.0	~⊹o n
Act Effct Green (s)	4.0	16.0		17.0	29.0	mky year	6.0	32.0	32.0	9.0	35.0	776. <b>939</b> .
Actuated g/C Ratio	≛ 0.04°	至0.18基		0.19	60:32 m	Fi di di	。 第0.07季	036	0.36	#0.10	0.39	
v/c Ratio	0.32	0.67	िल्ह्याच्या । जन	0.96	1.02	(1941)Salis Fig.	0.99	0.83	0.53	0.96	1.00	ruSullfayst
Control Delay	52.4	45.5	ere de	64.9	£72.6		126.13	:33.6%	<b>第4.6</b> 数		49.5	Transfer
Queue Delay	0.0	1.1	a deservició	6.5	0.0	Marite de la Company	0.0	0.0	0.0	0.0	0.7	AT Trac GTA
Total Delay	52.4	46.5至	THE STATE OF	71.5	72.6量	PUT THE	126.1	33.6		101.29	50.1	s, the cost
LOS	D	D	1 E 1 ST - 51 - 51	E	E	Marine Control	F	C	A	F	D	St. of "made in the
Approach Delay	as des	47.1题	<b>派生</b>		72.0		加热配	32.2		<b>担席</b> 原语	54.2	grynn web Marianas
Approach LOS	en perfort inner it.	D	in " who form it as".	1. 2. 35. ASSETTED A	E	AMBEN TO STEET THESE	en in um de crétable de	C	-40 mm mm 64 8 20	Section to the section of	D	· 12 17 244 04 14. 2 4
Stops (vph)	25	185	法编辑	508	459	后語等效	87	839	38	<b>4130</b>	1606	
Fuel Used(gal)	1	5	and the Armed State of the Stat	14	14		4	18	4	4	33	,,,,,,,,
CO/Emissions (g/hr)	上40章	₹ 324 🖳	诺索斯	976	乘991第	4	284	∮1286 <b>≩</b>	258	309	2308	<b>68.83</b>
NOx Emissions (g/hr)	8	63		190	193		55	250	50	60	449	
VOC Emissions (g/hr)	<b>13.</b> 9.	示念75要	美產品!	226	230		66	298	60	第72	535	制造機
Dilemma Vehicles (#)	0	0		0	0		0	0	0	0	0	
Queue Length 50th (ft)	图14	118	道是這	<b>3182</b>	<b>-344</b>		至68	282	经重0图	<b>98</b> 8	<b>≈</b> 406	
Queue Length 95th (ft)	40	#207		#290	#565		#177	364	62	#223	#532	
Internal Link Dist (ft)	計劃等	990			9718%	短腳的	智知是	226	國際經		<b>∮328</b> ₌	がは、
Tum Bay Length (ft)												
Base Capacity (vph)	1279图	337		648	592		118	1258	<b>%853</b>	到77%	1973	<b>FARM</b>
Starvation Cap Reductn	0	0		n	n		0	0	0	0	0	
Spillback Gap Reducting	那些0	至22号	建設是	22	<b>建20</b> 要	理學學	部署0世	<b>》作Q</b> 是	10%是	表 0 /	<b>5</b> .	
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	
Reduced v/c Ratio	0.32	0.72	识话是	1.00	》1.02章	<b>使用器</b>	0.99	0.83	0.53;	0.96	1.01	是是
· ·									4-			

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed Maximum v/c Ratio: 1.02

Intersection Signal Delay: 51.3 Intersection LOS: D
Intersection Capacity Utilization 88.2% ICU Level of Service E
Analysis Period (min): 15.

~ Volume exceeds capacity, queue is theoretically infinite.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue showii is maximum after two cycles

Splits and Phases: 10: Military Rd S & S 188th St



1 1 4 1 6 0

Movement	a de la la	HWE AWE THE STANK
Lane Configurations	<b>1</b> 1	ካ ተተ
Sign Control	Free	Free Stop

	•	-	~	•	· · · <del>* · ·</del>	•	4	1	-	1	ļ.	-√
इत्ताहरू द्वारत्य के व्यवस्था	a Birleinia			MELE	avviete	Wer	NABE	a Netr	MERM		- SIB)  B	SBR
Lane Configurations	*	朴			朴	#	*	4	, i i i i i i			* -
Ideal Flow (yphpl)	1900	1900	1900	1900	1900	-1900	⊈1900§	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	151	1 1000-051	9 .	. 15	学等基础	9	50H <b>5</b> 5	<b>可谓证</b>	9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Files被推翻性等等的			elier Majoria.		的預數	0.850	起等的新	0.930		-1, -1-	173	4.1.3
Flt Protected	0.950	4		o terrest but	aga careas 7.,	يشكس ليولك راحادي	0.950	0.974	1 million : 222		- P - P4 - P - 1	49.121.4
Satd: Flow (prot)	1770	3539	Ó.	0	3539	1583		1603		0	0.	0
Flt Permitted	0.950	with the common of the full	is in the settlement	ur (tat,useuar)	4°2°, `a tu ™Einupfüng	المانيانية المتملك والبيا	0.950	0.974	٠٠٠ - ١٩٩١	2 1 2 1 4 8 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		in many
Satd: Flow (perm)		3539	<b>∵</b> ↓ <b>0</b> ;	- TO	<b>∂3539</b> %	1583	1681		F 42 0	0.	0.	0
Right Turn on Red	त्र मिर्गित तालिक्षांत्र अस्ति । स्टब्स	. Serial Caraman Caraman	Yes	the distribution	" " - "im Wand i fed	Yes	arintena de 1911.	· subtracy to the Co	Yes		200 m v 121 mm	Yes
Said Flow (HTOR)					<b>学生演员</b>	£551		据第 <b>16</b> 9				4.15
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		<b>30</b> .			学等30章		PERKLE	30	1800年		<b>30</b>	Part of the second
Link Distance (ft)	Come of a reference of	650	e y to independent of the second	eri i Si New septembe	244	erran canal American	Secretary of the second	835	ವಿಶಾಜ್ವರ್ ನಿರ್ದೇಶಕ	regaring wallest	894	endant of the C
Travel Time (s)	2.00 空散沙	14.8	(1)	學學情	5:5		學的有學	19:0		<b>"是"</b>	20.3	(1)
Volume (vph)	556	2064	0	0	1362	1421	602	2	177	1125 (1125 1125 1125 1125 1125 1125 1125	0	0
Peak Hour Factor	0.92	0.92	. 0.92	0.92	₹0.92¥	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	604	2243	0 0	0	1480	1545	654	2	192	0	<i>∵∞-≃∞.</i> 0	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Lane Group Flow (vph	) 6045	2243	1900 <b>0</b> 70	HE TO	1480	1545	439	- 409		0.	<del>-</del> .	<b>0</b>
Turn Type	Prot	Carry distance		। শ্বনীৰ মিটালীক		Perm	Perm	er and	. Gertalin die e	-ជួយអូវ ភាព	at Table The Table	Carata
Protected Phases	·纳马图电 <b>7</b> 2	435-45		ener.	A 4 84			E 2	134.60		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	- (** <u>** 1</u>
Permitted Phases	रे भी दोच <i>ो पित्रे</i> के कि	· 经制度的人等的。	en vied kiedrijks	ar Verke <del>die Kirrige</del>	AREAS-EAR EAR	8	2	H. S.	ostrovanskih i i	कर्जा है। जिल्लाहरू	i in preferencies,	ಶಿಷ್ಟಾಪ ಶತ್ಯ
Tōtal Split (s) 医温度点	32.0	98.0	0.0	0.0	66.0		32.0	732.0	S 0.0	0.0	0.0	<b>ે</b> 0.0
Act Effct Green (s)	28.0	94.0	alem Maria (1997)	. ಅನ್ನು ಸ್ವಾಪ್ತ್ಯ ಪ್ರಕ್ರಿಸ್ತ್ರಿಸ್ತ್ರಿಸ್ತ್ರಿಸ್ತ್ರಿಸ್ತ್ರಿಸ್ತ್ರಿಸ್ಟ್ ಪ್ರಕ್ರಿಸ್ತ್ರಿಸ್ಟ್ ಪ್ರಕ್ರಿಸ್ಟ್ ಪ್ರಕ್ರಿಸ್ಟ್ ಪ್ರ	62.0	62.0	28.0	28.0	er war ar	೫ ಆರ್.ಕರ್ಮ್ -	. ಚಿತ್ರವಾಗಿ	- WELLER
Actuated g/C Ratio	0.22	<b>≇0.72</b> ⊈	<b>以入时或</b> 很	HENER	€0:48	0.48	0.22	0.22	SAMUL	ALL MARKET	改建连边	Part Y
v/c Ratio	1.59	0.88	erith is requested	र्वत्तर स्थलकारी प्राप्त	0.88	1.48	1.21	1.14	Sind Confession of	dice of the P	n wata <del>al</del> a ebata	Figure (Size)
Control Delay	309.9	震18.9億					161.9				No.	Contractor of the contractor o
Queue Delay	0.0	2.6	retail an same a	a emanaeco mado	0.0	0.0	0.0	0.0	maganar sanitan	SACHERET PARTY	a Austria esta	and health of the second
Total Delay	309.9	F21.4					161.9			STATE OF STATE	A POSTERNIA STEEDE VIOLE	
LOS	F	C	AIRE ALIMENTARY	n filologia (filologia)	D	F	F	F	<del>enterentale</del>	356.45 (75.11.1) ±	Caranga Nagaran	in merekan pi urtea
Approach Delay		82.6			142.2			149.4	建议为社	nicality.		
Approach LOS		F	C CARRESTAN, STR. +1	YEAR'S HOUSE	F	resistant.		F	er-er-caraca	atrial areas	[608] + bras 27% (122-5)	ir i Tair Trais
Stops (vph)	<b>395</b>	1505	THE THE	Table:	到78第	<b>整744</b> 3	織327廳	% 301¥	THE STATE OF			學說著
Fuel Used(gal)	41	32	Dite for the teacher	CLUSTON TON STATE	20	77	18	15		PAGAGA CARTON (C)	agar, a restrict mass	The Conf. Carl. A Com.
CO Emissions (g/hr)		2211					1241		ere er			的音道
NOx Emissions (g/hr)	563	430	LANGATERA LA	er e	266	1046	241	197	Fired String No. 174	in a second of the	रनिविक्य बेलस्टी स्टेस्ट्रे	Later and the
VOC Emissions (g/hr)	##F67.1%						288				<b>加州</b> 亚亚	
Dilemma Vehicles (#)	0	0	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	<b>计图记录记录记录</b>	0	0	0	0	e wantered e	Checking (F.A.)	- Lave Grand C. C.	的形式而行為
Queue Length 50th (ft)	2794F			商品品商					<b>克斯斯尼</b> 州			<b>阿斯斯</b> 德
Queue Length 95th (ft)		805	್. ⊹ು ಕಾರಾಗಿಕ್ಕಬೆನ	Printer Carlor		#1816	#694	#632	erandovi.	a state in the	really deliver	T DESCRIP
Internal Link Dist (ft)				1000	暴 164 5					o di nazi	- 814	類心。在
Tum Bay Length (ft)	PHARMA		AT 图 3 分解 II		mail and the same		がいた。自己は		PENTENTIAL P	engeriarit.	no vola	agrifit
Base Capacity (vph)	<b>张疆 3</b> 8 修	2550	-		STAAR	#40 <b>2</b> 3#	3624	าจรด				
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#### Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length 130

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:, Start of Green

Control Type: Pretimed Maximum v/c Ratio: 1.59

Intersection Signal Delay: 117.9 Intersection LOS: F

Intersection Capacity Utilization 150.9% ICU Level of Service H
Analysis Period (min) 15

Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles

Splits and Phases: 3: S 188th St & I-5 NB Ramp

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Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Control Type: Pretimed:

Maximum v/c Ratio: 1.02

Intersection Signal/Delay: 51.5
Intersection Capacity Utilization 88.3%
ICU Level of Service E
Analysis Penod (min): 15

Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles # 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles

Splits and Phases: 10: Military Rd S & S 188th St

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				2006
<b>1</b> ø5	<b>2</b> 6		ø7 <b>←</b> ø8	
		·	BEER SANGER	

### LEVEL OF SERVICE CONCEPT

Because intersection capacity and traffic flow performance, or "level of service", are prime factors in the process of developing and evaluating alternatives, a brief description is presented here for the benefit of the lay reader.

The ratio of existing traffic volume to available capacity provides a measure of the intensity of traffic loading relative to the ability of the street intersection to accommodate the traffic. The number of lanes, presence of turn lanes, type of traffic control, signal phasing, etc., are important factors in determining capacity. As the volume-to-capacity (v/c) ratio approaches a value of 1.0 at signalized intersections, extreme congestion sets in, with long backups and several complete changes of the signal cycles occuring before a motorist can proceed. Motorists at stop-sign controlled intersection approaches face extremely long delays when the v/c ratio approaches 1.0. As traffic queues lengthen, this congestion can also impede access to and from upstream abutting property.

The term "level of service" is used to describe traffic flow at intersections. For signalized intersections, the level of service is based on control delay per vehicle (see **table A-1**). Control delay is a measure of all the delay contributable to traffic control measures, such as a traffic signal. Control delay includes initial acceleration delay, queue move-up time, stopped delay, and final acceleration delay.

Table A-1 Level of Service and Volume/Capacity Ratio Relationships for Signalized Intersections									
Level of Service	General Description	Control Delay (seconds/vehicle) <sup>1</sup>	Intersection V/C Ratio <sup>2</sup>						
A	Free flow	≤ 10.0	≤ 0.60						
В	Stable flow (slight delays)	10.1 to 20.0	0.61 to 0.70						
С	Stable flow (acceptable delays)	20.1 to 35.0	0.71 to 0.80						
D	Approaching unstable flow (tolerable delay - occasionally wait through more than one signal cycle before proceeding)	35.1 to 55.0	0.81 to 0.90						
E	Unstable flow (intolerable delay, intersection operating at capacity)	55.1 to 80.0	0.91 to 1.00						
F	Forced flow (jammed)	> 80.0	> 1.00						

<sup>1.</sup> For operational analysis method which requires detailed geometric, traffic, and signal information usually used for existing conditions analysis.

Source: "Highway Capacity Manual", Transportation Research Board, 2000; and "Interim Materials on Highway Capacity", Circular 212, Transportation Research Board, 1980.

<sup>2.</sup> For planning-level analysis method. Planning-level analysis is used when there is less certainty in the input when default values are typically relied upon and future traffic forecasts are used.

Level of service A is a condition of unimpeded flow, while level of service C is often used in the design of new urban streets as the lowest acceptable level for peak periods. Congestion begins to occur at level of service D (v/c from 0.81 to 0.90). Because of funding and/or environmental constraints for improvements, this level of service is being used by more and more cities as an adequate level, particularly for improvements to congested existing facilities. Increasingly unstable traffic flow with excessive delay and congestion occurs as level of service E (capacity) is approached (v/c = 0.91 to 1.00). For v/c > 1.00, level of service F (forced flow) is obtained, and the intersection is overloaded or is jammed due to traffic backups from overloaded downstream intersections.

It should be noted that equal v/c ratios at several locations do not necessarily indicate equal overall performance of intersections. One intersection may experience a high v/c ratio for a considerable period of the day while at another intersection the peak period lasts a short time. In addition, a low level of service is more tolerable at a low-volume intersection than a high-volume location.

The general level of service concept also holds for stop-sign controlled intersections, although the capacity of the stop-sign controlled approaches is less than that of the signalized intersection approach. **Table A-2** shows the level of service criteria for unsignalized intersections.

Control Delay (d) <sup>1</sup>	Level of Service					
d ≤ 10	<b>A</b> •••					
10 < d ≤ 15	В					
15 < d ≤ 25	of the time of the contract of					
25 < d ≤ 35	D AND THE D					
35 < d ≤ 50	. The state of the					
d > 50	F2					

- 1. Control delay is measured in seconds per vehicle.
- For level of service F, when demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvements to the intersection.

Source: "Highway Capacity Manual", Transportation Research Board, 2000.

Capacity analysis for two-way stop-sign controlled intersections is based on the assumption that major street traffic is not affected by the minor street movements, and that left-turns from the major streets to the minor streets are influenced only by opposing major street through flow. Therefore, the level of service calculated for two-way stop intersections is based on delay experienced by only the minor street movements and the major street left-turn movement.

MEM	DRANDUM
E C	Karl Hufnagel Date: May 12, 2004
From:	Kurt Gahnberg 1G: 02250.00
GG:	
Subject⊭	Bow Lake Transfer Station — Summary of Preliminary Transportation Assessment

This memorandum briefly documents the results of the preliminary traffic assessment of access enhancement options for the existing Bow Lake Transfer Station, that were presented to KCSWD staff at a meeting March 5, 2004. It includes:

- Background
- Comparison of Alternatives
- Summary

# Background

Options to enhance access at the Bow Lake transfer station have been under investigation by the RW Beck team since summer 2003. Current site access is hampered by the close proximity of the transfer station access road to the existing ramp terminals at the S 188th Street/I-5 Interchange. This close spacing results in traffic queue interference with access traffic, especially slower moving transfer trucks. In addition, safety is a concern for traffic entering S 188th Street from the site, and for left turning traffic from S 188th Street into the site. The Bow Lake Transfer Station remains an important component of King County solid waste management strategy far into the future.

# **Range of Options Considered**

A wide range of access enhancement options have been considered by the team, ranging from minor channelization modifications, to traffic signalization of the site entrance intersection with S. 188th Street, to significantly more-expensive roadway and ramp revisions requiring coordination with Washington State Department of Transportation (WSDOT) to effectively implement. None of the lowest cost options provided any substantial benefit to improve existing traffic operations, or adequately accommodate future traffic volume levels associated with anticipated growth.

The only conceptual option that was determined to provide adequate traffic operational benefit was to combine the I-5 northbound ramps with the site access road, as well as S. 188<sup>th</sup> Street and Orilla Road approaches, into what is commonly referred to as a single point interchange. The most recent analysis has focused on this

core option, with further examination of permutations of this option. The most current evaluation focuses on the following options:

- **Single Point Interchange (SPI)** Basic design which brings the west leg of S. 188<sup>th</sup> Street into a single intersection with the I-5 northbound ramps, the east approach from Orillia Road, together with the access to the Bow Lake Transfer Station.
- SPI With Right Turn Bypass Removes right turning traffic from the I-5 northbound off ramp from the intersection, and accommodates them in a separate turning ramp to eastbound Orillia Road.
- SPI With Right turn Bypass and Orillia Road/I-5 Northbound Flyover

   This option removes the westbound Orillia Road destined for northbound for northbound I-5 from the intersection operation by accommodating them in a flyover ramp.

The basic option (SPI) improves operation over existing conditions by accommodating all traffic at a single point, allowing signalized control of the Bow Lake Transfer Station access, and doing so in a way that increases intersection spacing between the northbound and southbound I-5 ramp terminals. Implementation of any of the options above will require the close coordination between WSDOT and King County, as well as the neighboring city of Tukwila.

The analysis considered the following traffic characteristics:

- Background Traffic Growth A long range traffic horizon was considered.
  Traffic forecast factors were acquired from King County, and included the
  Green River Valley and Highline subareas, which are forecast to grow at
  approximately 23 and 5 percent, respectively. Application of these two data
  points resulted in consideration of a worst case and probable traffic forecast
  for 2023 conditions.
- AM and PM Peak Hour Traffic Analysis Both AM and PM peak hour traffic conditions were examined.
- Intersection Level of Service Traditional intersection analysis was conducted to assess future traffic delays and compare the affect of the identified options on the traffic capacity of the I-5/S 188<sup>th</sup> Street/Orillia Road freeway ramps and site access driveway.
- Traffic Queuing The close spacing of the S. 188<sup>th</sup> Street ramp terminals with northbound and southbound I-5, together with the Bow Lake Transfer Station access road, requires consideration of the relative effect of traffic queues occurring between intersections to understand the operational viability of future options.

# **Comparison of Alternatives**

The following summarizes the preliminary traffic assessment of the single point interchange options considered. It describes intersection Level of Service (LOS), traffic queuing, and other factors relevant to comparing the operational options for the following

#### Intersection Level of Service

Attachment 1 (E@S Handout from Meeting) summarizes the LOS analysis for each of the alternatives for 2023 conditions. Two scenarios were developed. First, a worst case assumption that all traffic would grow at a rate consistent with the Green river Valley growth factor (23%) was evaluated. Second, a hybrid growth rate that applied the Green River Valley rate only to the east leg of the intersection (Orillia Road approach) while applying the lower 5 percent growth rate to the other primary approaches. The latter reflects a more-reasonable approach, in that the high level of existing traffic associated with the I-5 off ramps, as well as S. 188th Street to the west, are likely to grow at a substantially lower rate than the higher growth Green River Valley. They are both presented to reflect sensitivity analysis.

The analysis summarized in Attachment 1 generally shows that the PM peak hour will continue to experience higher levels of traffic congestion than occur during the AM peak hour. It also shows that the blended growth rate results in more-feasible levels of service associated with each of the options. During the PM peak hour, resulting traffic operations would be similar for both the basic and basic with right turn bypass case, LOS "E". When the effect of the traffic removed as a result of the flyover ramp is added, operations would improve by a complete level of service, resulting in LOS "D", and about 15 seconds less delay than described for the other options in the PM peak hour.

In summary, traffic growth to 2023 will contribute to further substantial decline in overall street system and access performance surrounding the Bow Lake Transfer Station. The single point interchange will improve operations and safety compared to doing nothing, but alone would result in continued significant delays. Addition of the right turn ramp bypass alone would improve AM peak hour operations, but have a minimal impact on relieving PM peak hour congestion. However, with the addition of the flyover ramp to eliminate westbound traffic from Orillia Road to northbound I-5 from the intersection, a significant operational improvement could occur.

#### **Traffic Queuing**

Traffic queuing associated with the 2023 conditions were also reviewed. All options would provide adequate queuing capacity to accommodate anticipated traffic demand, with the exception of the eastbound approach to the intersection on S. 188<sup>th</sup> Street. This movement currently has traffic queues that exceed the available capacity, and will continue to do so in the future under any scenario. This queuing, while significant, would not directly affect the access viability for the single point

The Transpo Group page 3

interchange in serving the Bow Lake Transfer Station. However, fully understanding the interaction between traffic signals and intersections in the interchange area will require ongoing evaluation, and may receive additional scrutiny in light of any specific development or transportation improvement proposal.

# Summary

KCSWD is considering the further development of the Bow Lake Transfer Station to support the County's solid waste management strategy. Current site access is problematic in that heavy through traffic volumes on S. 188th Street, together with turning movements associated with the closely spaced I-5 ramp terminals, result in substantial access delays, and safety concerns for traffic turning into and out of the Bow Lake site. Of the range of improvements considered, the modification of the I-5 northbound ramps to realign the landing point to provide a 5-way single intersection that combines the Bow Lake access road provides improved safety and operations. However, in order to provide operating conditions of LOS "D" or better during both AM and PM peak hour conditions, it is necessary to consider further substantial investment in the roadway infrastructure, including the development of a single point interchange with the I-5 northbound ramp terminal and the Bow Lake transfer station access, incorporation of a separate right turn access from the northbound off-ramp to eastbound Orillia Road, and the development of a flyover structure to intercept westbound Orillia Road traffic destined for northbound I-5.

Based on this analysis, further investigation of the feasibility and cost of construction associated with this concept should be undertaken.

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Attachment

M\02\02150 Bow Lake TS\Summary Memo - Traffic Assessment.doc

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#### ATTACHMENT

# Bow Lake Transfer Station Level of Service

PM Peak Ho	π [(θ\$ <u>-</u>	Single	oint NB	Remplo	(सहस्ता)	χ <b>η</b>
	2023' with	ı Green Vallı	ey Growth:	2023 v V	vith Highline /alley Growt	e/Green h
Intersection Options	LÓS!	Delay²	V/C	LOS	Delay	V/C
Basic Design	1 - 1 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -	88.4	1.08	E CONTRACTOR	61.3	1.01
w/right by-pass			The state of the s	Emmany	60.8	1200

0.91

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flyover<sup>4</sup>

w/ right by-pass and

Level of Service.
Average delay in seconds per vehicle.
Volume to capacity ratio.
The flyover alternative was also evaluated with the existing intersection geometry. The results indicated overall operations were similar to or worse than the option with the flyover added to the single point intersection; and resulting traffic queues between existing intersections were unacceptable.

# AM Peak Hour LOS - Single Point NB Ramp Intersection

	.2023 with	i Green Vall	ey Growth		vith Highline /alley Growt	/Green h
Intersection Options	, Los :	Delay	V/C -	LOS	Delay	* V/C :
Basic Design	The second secon	76.6	1.04	E	61.4	0.98
w/ right by-pass	The second secon	56.8	0.98	D	45.8	0.93
w/ right by-pass and flyover!	The state of the s	252 272 2 472 2 273 274 274 274 274 274 274 274 274 274 274	0.87		26/	

- Level of service:
  Average delay in seconds per vehicle.
  Volume to capacity ratio
  The flyover alternative was also evaluated with the existing intersection geometry. The results indicated overall operations were similar to or worse than the option with the flyover added to the single point intersection; and resulting traffic queues between existing intersections were unacceptable.

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